Bank Stability and its Determinants in the Nepalese Banking Industry

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Abstract

This paper investigates bank stability and its bank-specific, industry-specific, macroeconomic and institutional determinants for the Nepalese banking industry. The study employs the system GMM to a panel of bank-level data covering the period from 2004-2018. The results show that the stability of the Nepalese banking industry improved during the early years of the study period, i.e., 2004-2007; however, it exhibited a decaying trend for the rest of the study period. The analysis reveals that the major factors responsible for this deterioration are capital adequacy, asset quality, and earnings of the banks. Most of the dimensions have shown improvements during the initial years of the study period; however, this trend reversed post-2007.The study groups the banks into three categories: stable, moderately stable, and less stable banks as per their respective stability score. The estimation results indicate that a positive bank stability persistence exists in the Nepalese banking industry. Results suggest that credit growth has a negative impact on the stability of the banks. The results of the study support the concentration-stability hypothesis. Income diversification appears to have a positive impact on the stability of the banks. Findings disclose that inflation is playing a crucial role in impacting the stability of the banks. The study reveals that the GFC had no significant impact on the stability of the Nepalese banking industry.

Key Words: Nepal, PCA, Banks, Panel Data, System GMM

JEL Classification:G21, G28

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I. INTRODUCTION

The banking industry is the most crucial part of the financial system (Geršl and Heřmánek, 2008). It plays a critical role in economic growth at firm, industry and macroeconomic levels (Mittal and Garg, 2021). The history of banking has demonstrated that this sector is vulnerable to several risks and instabilities, and perhaps it is the only sector of an economy where several risks are managed jointly (Cebenoyan and Strahan, 2004). Over the last few decades, notable developments have taken place in this sector regarding deregulation, innovations, diversification, competition and financial globalisation.At present, the reach of the banking industry has expanded across the globe; consequently, it has become more inclusive, vibrant, and dynamic. The increased financial globalisation has enlarged the financial market opportunities many folds; however, it has also enlarged the magnitude of risks and instability concerns. In the last two decades, the issue of bank stability has become very crucial, and especially after the Global Financial Crisis (GFC) of 2007-09, it has gained widespread attention from researchers and policymakers. Regulatory authorities worldwide are increasingly paying attention to macro-prudential norms to maintain stability in the financial systems. Further, in the present times, when the financial systems are interlinked across the globe in a very complex way, instability in the financial systems can do colossal damage to the world economy.The GFC has established that neither price stability nor traditional macroprudential regulations are sufficient to maintain financial stability (Mendonça and Moraes, 2018). Central banks worldwide have acknowledged that financial stability has equal relevance, along with inflation control and economic growth.

Nepal is an emerging economy, and similar to other emerging economies, the financial sector of Nepal is bank-dominated. The capital market of Nepal is underdeveloped, and the Nepal Stock Exchange Limited is the only Stock Exchange of Nepal. Hence, the banking sector of Nepal plays a major role in financial intermediation. Commercial banks in Nepal are growing at a significant pace, and they play a significant role in the Nepalese banking industry (See table 1). At present, the banking sector of Nepal is facing various challenges in terms of mounting NPAs, the concentration of the lending to few sectors and flawed credit screening and amidst these challenges, some banks have already failed during the last

few years and faced liquidation (Sapkota, 2011). During 2001, Nepal bank limited and RBBL faced huge NPA problems, which impacted their performance considerably. Studies have shown that deprived credit appraisal and excessive exposure to the real sector are some of the key factors responsible for mounting NPAs (Sapkota, 2011). The Nepalese economy experienced three years (2017-2019) of strong economic growth of an average of 6.5 percent; however, in the year 2020, this trend reversed amidst the Covid pandemic (Nepal development update, July 2020). Given the role of the banking sector in Nepal and contemporary industry-specific and macroeconomic challenges, it is vital to ensure stability in this sector. The crucial role played by the banking sector, especially by the commercial banks of Nepal in economic development, coupled with post-crisis bank stability concerns, drives the key motivation for this study.

The present study attempts to assess bank stability and its determinants in the context of Nepalese commercial banks. More precisely, the study seeks to answer the following profound research questions, how bank stability of Nepalese commercial banks has progressed during the study period. How have different dimensions of bank stability impacted the overall bank stability? What determines the stability of the banking sector of Nepal? Given these research questions, the study aims to assess the bank stability of the Nepalese commercial banks for the period 2004-2018. The study constructs the bank stability index (BSI) using the Principal Component Analysis (PCA), weighted CAMEL1 framework to achieve this objective. The BSI is a comprehensive composite index based on five dimensions of bank stability.

In the existing literature, most of the studies have assessed the bank stability using single indicator-based approaches like the GNPA ratio, Loan loss provisions, ROA, or Z-score based measures; however, these measures do not capture all dimensions that can influence the stability of a bank (see Section III). Further, the studies that relied on index-based approach (Ghosh,2011; Kočišová and Stavárek; 2015) have mainly employed the equal weigh criterion. The major problem with the equal weight criterion is that it doesn't factor in the relative importance of the variables and

[1] This approach was later revised in 1997 to include another factor Sensitivity "S". This study relied on the original model as it implicitly accounts for the factors relating to market sensitivity.

assign equal importance to all variables. However, in the actual phenomenon, some of the dimensions might be more important in influencing bank stability. The weights assignment approach employed in the present study counter this problem by using the PCA weights. This approach accounts for the relative importance of different dimensions of bank stability. The study's second objective is to group the banks into three different categories: stable, moderately stable, and less stable banks based on their individual level of bank stability. The Final objective is to explore the determinants of bank stability. For achieving this objective, the study investigates the impact of bank-specific, industry-specific, macroeconomic and institutional variables on the stability of the Nepalese commercial banks by employing the two-step system GMM. To the best of the authors' knowledge, this is the first study that explores bank stability and its determinants along with the persistence effect for the Nepalese banking industry. Hence, the present study contributes to the banking literature, particularly concerning the issue of bank stability in emerging economies.

The rest of the paper is structured as follows. Section II reports some stylised facts about the Nepal banking industry. Section III presents a review of the literature on the measurement of bank stability and its determinants. Section IV discusses the data source and the process of index construction. Section V presents the findings of the study, and Section VI is concluding in nature.

II. STYLISED FACTS

Over time, the number of commercial banks has decreased due to mergers; however, the outreach of commercial banks has expanded. As shown in table 1, commercial banks dominate the overall sector as they hold the largest market share. The asset share of commercial banks has shown a continuous increase as it increased from 77 percent in 2010 to 83 percent in 2018. The share of development banks and financial companies has declined gradually; however, microfinance development banks' share has increased gradually. The assets share of development banks has decreased from 11 percent to 9.99 in 2018. In the case of financial companies, the assets share declined sharply from 11 percent in 2010 to 3 percent in 2018.

Post-liberalisation, the number of private sector banks has increased drastically, and their share in the total advances, deposits, and total assets is rising gradually;

however, the public sector banks still have a sizeable market share in the industry. As of mid-July 2020, 27 commercial banks were operating in the Nepalese banking industry, out of which three were public sector banks.

Table 1:Asset % share of banks and financial institutions (mid-July, 2010 to 2018)

Bank and Financial institution	2010	2011	2012	2013	2014	2015	2016	2017	2018
Commercial banks	77	75.3	77.3	78.2	78	78.73	79.74	83.41	82.76
Development banks	11	12	12.4	13	13.6	13.34	12.81	9.71	9.99
Financial companies	11	10.9	8.2	6.6	5.8	4.79	3.78	2.63	2.56
Micro finance development banks	2	1.8	2.2	2.2	2.6	3.14	3.68	4.26	4.69
Total	100	100	100	100	100	100	100	100	100

Source: *Bank and Financial Institutions Regulation Department, Nepal Rastra Bank.*

Total deposits, loans and advances, and total assets of the commercial banks have exhibited an increasing trend, and from 2017 to 2018, the deposits of the commercial banks increased by 19 percent. The deposits of public and private banks grew by approx. 10 and 20 percent respectively during this period. The loans and advances of the commercial banks increased by 21.26 percent from 2017 to 2018. The growth in loans and advances during this period was approx. 9 and 23 percent, for public and private banks, respectively.Similarly, during the same period, the total assets of the commercial banks increased by approx. 18 percent. The total assets of public and private sector banks grew by 7 and 19 percent, respectively. Stylised facts reflect that commercial banks play a crucial role in the Nepal banking industry and a more significant role in the Nepalese financial sector.

III. REVIEW OF THE LITERATURE

Given the significance of the banking sector and its stability, several efforts have been made to assess the stability of this sector. The existing literature has used several approaches to assess the stability of the banks. These approaches range from a single indicator-based approach to index-based approaches. In this direction, Geršl and Heřmánek (2008) study the different indicators of financial stability suggested by the International Monetary Fund (IMF). They argue in favour of developing an aggregate financial stability indicator and argued that an aggregate financial stability indicator could help frame a more appropriate framework for measuring financial stability and better operationalisation of the concept of financial stability.

Laeven and Tong (2016) study the stability condition of banks operating in 32 countries by employing three major indicators: tier 1 capital, ratio of loans to total assets, and deposits to total assets ratio. The study found that the capital base plays a significant role in dealing with uncertainties and well-capitalised banks are less prone to systematic risk. The study observed a negative relationship between bank-size and stability. Similarly, Swamy (2014) study the relationship among various indicators of banking stability. The study results demonstrate that liquidity is reciprocally linked to capital adequacy, asset quality, and profitability in the bank-dominated financial systems. Further study finds that a shock to a particular variable of stability gets transmitted to other variables through the dynamic structure.

Fielding and Rewilak (2015) explore the link between financial fragility and credit booms by assessing the banks operating in Canada, Greek, and the United States for the period 2012-2015. The study argues that it might neither be fragility nor boom alone, which affects the probability of crisis; however, the combination of both fragility and boom may create the conditions responsible for the crisis. Further, the study highlighted an important finding that fluctuation in liquidity does not harm the banking system, provided the average annual return on a bank's assets is more than 1.5 percent.

Chiaramonte and Casu (2017) use bank-level data to test the relevance of structural liquidity and capital ratio on the probability of bank failure for European Union banks. The study finds that the likelihood of bank failure and distress decreases with higher liquidity holdings, and capital ratios are significant only for large banks; further capital and liquidity ratios are complementary in ensuring bank soundness. The study argues that Basel III liquidity and capital norms significantly reduce the probability of bank default, and the study supported the Basel III initiative on structural liquidity and increasing regulatory focus on large and systematically important banks. Diaconua and Oanea (2015) study the impact of bank-specific and macroeconomic factors on the profitability and stability of credit co-operatives banks for 34 countries for the period 2008 to 2013. The study finds that bank-specific factors are more critical for both profitability and stability. The study revealed that loans and advances significantly impact profitability and stability; however, the direction of the relationship is different. In the case of profitability, it is positive, and

in the case of stability, it is adversely impacting. Further study found that the liquidity ratio and GDP growth rate affect profitability. The study concludes that higher profitability does not guarantee more stability.

Shah and Jan (2014) investigate the performance of the private sector banks in Pakistan by employing Return on Assets (ROA) and interest income as measures of the financial performance of the banks. The study reveals that the bank size has a strong negative impact on the return on assets. The study found a negative impact of the return on assets on operational efficiency. Further study found a negative relationship between interest income and operational efficiency. In this direction, Ahmad and Mazlan (2015) rely on different economic risks like credit, liquidity, and market risk to construct a bank stability index for Malaysian banks. The study employs bank's credit to the local private sector, real deposits, financial leverage, and time-interest-earned ratios as a proxy for credit, market, and liquidity risk. The results of the study explain the trend in bank fragility for both local-based and foreign-based banks. They find that both bank-specific and macroeconomic variables at the individual level do not affect the fragility of the foreign-based bank. In local-based banks, asset quality ratio, bank asset size, and management quality are significant determinants of bank fragility.

Alshubiri (2017) assesses the variable which can impact the financial stability of banks. The study scrutinise bank-specific and macroeconomic variables. The study assessed bank stability by employing Z-score. The study reveals that only bank-specific variables significantly impact the banks' financial stability; however, macroeconomic and external governance variables are insignificant in explaining Oman's financial stability. In Nepal's case, there are very few studies; however, few studies have attempted to capture the scenario in this regard indirectly. Similarly, Ozli (2018) investigates the bank stability determinants in Africa by using four measures of stability: loan loss coverage ratio, insolvency risk, asset quality ratio, and level of financial development. The study reveals that the size of the banking industry, bank concentration, efficiency and presence of foreign banks are some of the key determinants of bank stability. The study further revealed that institutional indicators like government effectiveness, political stability, regulatory quality, investor protection, control for corruption and unemployment level also impact the

banking stability in Africa. Chand et al. (2021) study the bank-specific, macro-finance and structural determinants of bank stability for Fiji. Findings of the study revealed that credit risk, funding risk, bank size and HHI are positively associated with bank stability. The study found that the level of inflation and economic growth positively impact the stability of the banks.

Shrestha (2020) investigatesthe impact of bank-specific factors on the financial performance of Nepalese commercial banks. The findings of the study revealed that bank-specific factors significantly impact the financial performance of commercial banks. Study further show that operating efficiency, managerial efficiency, and assets quality positively impact the financial performance of the banks. The study observed a negative impact of credit risk on the financial performance of banks. Thagunna and Poudel (2013) assess the efficiency level of banks operating in Nepal and covered the period from 2007-08 to 2010-11. The study employed Data Envelope Analysis (DEA). The study finds that the efficiency level of the banks in Nepal is relatively stable and has increased overall. The study observed no significant relationship between ownership structure and efficiency level.

From the literature review, it is clear that the researchers have made numerous research efforts to assess the stability of the banking sector. Several studies have attempted to assess bank stability by employing various indicators like Z-score, ROA, NPAs. Some of the studies have used camel based approach. In Nepal's case, studies have explored profitability and efficiency; however, we did not find any study that measures the stability of the banking sector. We also found a minimal number of studies that have looked into the stability of the banking sector of the developing nations by employing a comprehensive approach. Given this backdrop present study contributes to the existing literature by assessing the stability of the commercial banks of Nepal for the pre-and post-GFC period.

IV. DATA AND METHODOLOGY

4.1 Construction of Bank stability Index

The choice of the dimensions of the bank stability index is derived from the CAMEL framework. This framework is a widely used measure to test the banking sector's

soundness. Eleven financial ratios/indicators have been aggregated into five dimensions: capital adequacy, asset quality, management efficiency, earning, and liquidity. The detail about the different dimensions and their respective weights is presented in Table 2.

The study employs the principal component analysis (PCA) approach for the generation of weights to different dimensions of the bank stability index. The study relied on four steps procedure to construct the BSI. The index construction process can be explained as follow.

Table 2: Dimensions and indicators of the bank stability Index

SN	Dimensions and PCA weights (%)	Financial variables/ratios	Impact on stability
1	Capital adequacy (20)	(i) Core Capital to risk-weighted assets	+
		(ii) Capital fund to risk-weighted assets	+
2	Asset quality (20)	(iii) Net NPA to total advances	-
3	Management efficiency (16)	(iv) Staff expenses to total expenses	-
		(v) Office operational expenses to total expenses	-
		(vi) Wage bills to total expenses	-
4	Earnings (18)	(vii) Return on assets	+
		(viii) Net interest margin	+
		(ix) Growth in net profit.	+
5	Liquidity (26)	(x) Liquid assets to total assets	+
		(xi) Demand deposits to total deposits	+

Source: *Authors' elaboration from IMF financial soundness indicators.*

In the first step, outliers are identified and removed from the data. Following (Beck et al., 2013), the winsorisation 2 criterion is employed to remove outliers. The study winsorised each variable at one percent and replaced the outlier values with the nearest value at both extremes. In the second step, variables that are negatively linked to bank stability are adjusted3so that all variables directly correlate with bank stability. For doing so, the reciprocal of such variables/ratios is taken. For example, a variable (p) that is negatively associated with the BSI, is adjusted by taking the inverse of that variable (1/p). This process ensures a direct relationship between the adjusted variable/ratio and BSI. In the third step, we normalised the variable/ratios so

[2] Winsorization a method employed for limiting the effect of extreme values in the data sets. It is named after the biostatistician Charles P. Winsor.

[3] For the adjustment of a particular financial ratio, study take the reciprocal of such financial ratios.

that it ranges between 0 and 1. This restriction assists in index generation and further helps in the categorisation of the banks. The study employed empirical normalisation. The normalisation process can be illustrated as follows:

$$I_{i,t\,Norm} = \left(\frac{A_{i,t} - (I_t)_{\min}}{(I_t)_{\max} - (I_t)_{\min}} \right)$$

Where Inormis the normalised value of the variable, Ait is the actual value of a particular variable, (I) minis the minimum value of the variable, and (I) max is the maximum value of the variable. In the fourth and final step, weights were assigned to all five dimensions using the PCA approach and clubbed them into a single dimension called the bank stability index. The process of weights calculation is provided in the appendix.

4.2 Data

The data on the financial variables is obtained from various reports of Nepal Rastra Bank, namely, Annual Bank Supervision Report, Banking, and financial statistics. The study covers the period from 2004-2018, i.e., 15 years. The present study is based on an unbalanced panel, and the number of banks in different years has varied as the new banks entered the industry and several merged during the study period. Those banks have been included, which have operated for at least three years in the industry. Data on macroeconomic and institutional variables culled from the World Bank official website. The study has employed the world governance indicator dataset of the World Bank as a measure of institutional quality. Finally, the study relied on the Federal Reserve economic database (FRED) for data on the real effective exchange rates.

4.3 Variables and testable hypothesis

The study employs the bank stability index (BSI) as a dependent variable as a proxy of bank stability. We have used the log transformation of the BSI in our different model specifications. The study has investigated the impact of four categories of the variables on the stability of the banks, namely, bank-specific, industry-specific, macroeconomic and institutional variables, along with the crisis dummy. The bank-

specific category includes six variables that capture the impact of bank-specific characteristics on its stability. The second category consists of two industry-specific variables. The third category of variables subsumes three macroeconomic indicators which capture the impact of macroeconomic developments in which the banks function. The fourth category of variable includes six institutional variables, which captures the impact of institutional change on the stability of the banks. The detailed information about the variables employed in the study, their definitions, testable hypothesis and expected relationship direction is given in Table 3.

4.4 Econometric model

To identify the bank stability determinants and persistence effect of bank stability, study relies on the dynamic panel estimation technique. We employ the generalised method of moments (GMM). The econometric model can be expressed as follow.

$$Y_{i,t} = \alpha + \phi Y_{i,t-1} + \sum_{l=1}^{L} \beta_l X_{i,t-k}^{l} + \sum_{m=1}^{M} \chi_m X_{t-k}^{m} + \sum_{n=1}^{N} \delta_n X_{t-k}^{n} + \sum_{n=1}^{N} \kappa_o X_{t-k}^{o} + \sum_{d=1}^{D} \eta_d X_{i,t}^{d} + \varepsilon_{it}$$

Here $|\phi| < 1; i = 1$ to N; t = 1 to T; k = 0, 1 to L, and $\varepsilon_{it} = \nu_i + \xi + \mu_{it}$

The subscripts i and t represent the cross-sectional and time-series elements of the panel, respectively. In equation Y_{it} is the dependent variable and $Y_{i,t-1}$ is the one period lag of the dependent variable. In the equation ϕ, β, χ, δ, κ and η are the coefficients to be estimated. ϕ represents the persistence effect of the dependent variable, which is bank stability in our case, and its value varies between 0 and 1. $X_{i,t-k}^{l}$ is the vector of bank-specific variables (l) for ith bank for t-kth time period. X_{t-k}^{m} is the vector of industry-specific indicators (m) in t-kth time period, X_{t-k}^{n} is the vector of the macroeconomic variable (n) in t-kth time period and X_{t-k}^{o} is the vector of the institutional indicators (n) in t-kth time period. $X_{i,t}^{d}$ is the vector of the dummy variables (d) for ith bank in the t time period. ε_{it} is the error component comprises of ν_i, ξ and μ_{it} where ν_i captures the unobserved bank-specific effect, ξ captures the unobservable time effects, and μ_{it} is the idiosyncratic error term.

Table 3: Description and summary statistics of the variables

Variables	Symbol	Definition	Expected Sign	Hypothesis	Mean	Std. Dev.	N
Dependent variable							
Bank stability	BSI	PCA weighted index of bank stability		0.401	0.106	328	
Independent variables							
Bank-size	SIZE	Log of total assets	(+/-)	Too big to fail	10.551	0.840	328
Return on Assets	ROA	Ratio of return on average assets.	(+)	-	0.015	0.020	328
Credit Growth	CREDIT	Annual growth in the total loans and advances.	(+/-)	Bad management	42.583	342.051	328
In(Efficiency)	EFFICIENCY	Ratio of operating expenses to total assets.	-	-	0.082	0.025	328
GNPL Ratio	GNPL	Ratio of gross non-performing loans to total loans.	(-)	-	3.544	7.019	328
Diversification	NII	Ratio of non-interest income to total assets.	(+/-)	Diversification-stability	23.920	1.937	328
Concentration	CR3	Share of top 3 banks in terms of total advances.	(+/-)	Concentration-stability	27.021	10.039	328
Boone indicator	BOONE	Elasticity of profits with respect to the marginal costs	(+/-)	Quiet life	-0.074	0.011	328
GDP growth rate	RGDP	The growth rate of real GDP at 2010 prices.	(+)	-	4.565	1.869	328
Inflation rate	INF	Annual inflation rate	(+/-)	-	8.506	2.109	328
Real effective exchange rate	REER	The annual average of real effective exchange rate	(+/-)	-	88.54	14.856	328
Control of corruption	CC	Control for corruption estimate form the (WGI)	(+)	Grease/Sand the wheels	-0.731	0.080	328
Government effectiveness	GE	Government effectiveness estimate from the (WGI)	(+)	-	-0.891	0.081	328
Political stability	PS	Political stability estimate from the (WGI)	(+)	-	-1.265	0.492	328
Regulatory quality	RQ	Regulatory quality estimate from the (WGI)	(+)	-	-0.723	0.101	328
Rule of law	RL	Rule of law estimate from the (WGI)	(+)	-	-0.725	0.119	328
Voice and accountability	VA	Voice and accountability estimate form the (WGI)	(+)	-	-0.495	0.262	328
Global financial crisis	GFC	Variable take value 1 for crisis years (2007-2009), and 0 otherwise	(-)	-	-	-	328

Source: *Authors' elaboration.*

4.5 Two-step system GMM

The prevailing literature claims that it is not appropriate to employ the OLS, fixed, or random effect models when the lagged dependent variable is used as an explanatory variable in the regression equation. The use of a lagged dependent variable introduces the problem of endogeneity in the model. Arellano and bond (1991) advocate the use of difference GMM estimation techniques in a situation where the model suffers from the problem of endogeneity; however, there are certain limitations of the difference GMM in short panels. The predictive power of the difference GMM model is very low when the time dimension of the panel is small (N > T) Blundell and bond (1998). Arellano and Bover (1995) and Blundell and bond (1998) introduced the system GMM estimator to address the problem of difference GMM. System GMM estimator simultaneously conglomerates the level and difference equation and provides more robust estimates, and also deals with biases associated with the small panel. The study tested for the assumption of serially uncorrelated errors by employing the Arellano and Bond tests. Further, we tested the overall validity of the instruments using the Hansen J test.

V. EMPIRICAL FINDINGS

We start our empirical analysis by presenting the summary statistics of the BSI. Table 4 presents the mean values, maximum and minimum, standard deviation, Skewness, and Kurtosis values of BSI and its dimensions.

Table 4
Summary statistics of BSI and its dimensions

Variables	Obs.	Mean	Max.	Min.	Std. Dev.	Skewness	Kurtosis
BSI	328	0.397	0.728	0.159	0.106	0.377	2.703
Capital adequacy	328	0.599	1.000	0.000	0.288	-0.459	2.265
Asset quality	328	0.162	1.000	0.000	0.258	2.351	7.601
Management efficiency	328	0.407	0.944	0.100	0.152	0.711	3.990
Earnings	328	0.410	1.000	0.008	0.185	0.685	3.334
Liquidity	328	0.402	1.007	0.000	0.237	0.760	2.917

Source: *Authors' computations.*

5.1 The Nepalese banking industry and bank stability

In this section, we present the finding of the study and highlights how the stability of the Nepalese commercial banks evolved during the study period. Table 5 presents the dimensional indices and bank stability index of the Nepalese banking industry.

Table 5: Yearly averages of BSI and its dimensions

Year	Capital adequacy	Asset quality	Management efficiency	Earnings	Liquidity	BSI
2004	0.151	0.020	0.071	0.103	0.128	0.473
2005	0.147	0.065	0.058	0.111	0.118	0.499
2006	0.162	0.073	0.074	0.102	0.109	0.521
2007	0.152	0.048	0.077	0.124	0.121	0.522
2008	0.159	0.024	0.061	0.061	0.133	0.437
2009	0.167	0.029	0.065	0.063	0.118	0.442
2010	0.153	0.058	0.056	0.049	0.120	0.436
2011	0.115	0.027	0.068	0.050	0.104	0.364
2012	0.130	0.035	0.063	0.065	0.114	0.407
2013	0.117	0.021	0.060	0.054	0.118	0.370
2014	0.124	0.021	0.066	0.079	0.100	0.391
2015	0.112	0.023	0.070	0.075	0.085	0.365
2016	0.069	0.030	0.064	0.079	0.104	0.346
2017	0.070	0.032	0.058	0.065	0.069	0.295
2018	0.067	0.018	0.073	0.078	0.073	0.310

Source: *Authors' computations.*

Fig. 1 exhibits the evolution of the bank stability of commercial banks. The shaded area shows the GFC period, i.e., 2007-2009. Fig. shows that from 2004 to 2006, the BSI has exhibited an upward trend; however, post-2007, the trend reversed and started to decay. This fall in the BSI graph remained persistent for the rest of the study period. During the period 2007-2009, the BSI fell significantly, which coincided with the period of GFC highlighted in the figure. From this, it can be stated that prior to 2007, the BSI of the Nepal banking industry was improving; however, it fell significantly from 2007 onwards.

Figure 1: Evolution of BSI of Nepalese commercial banks

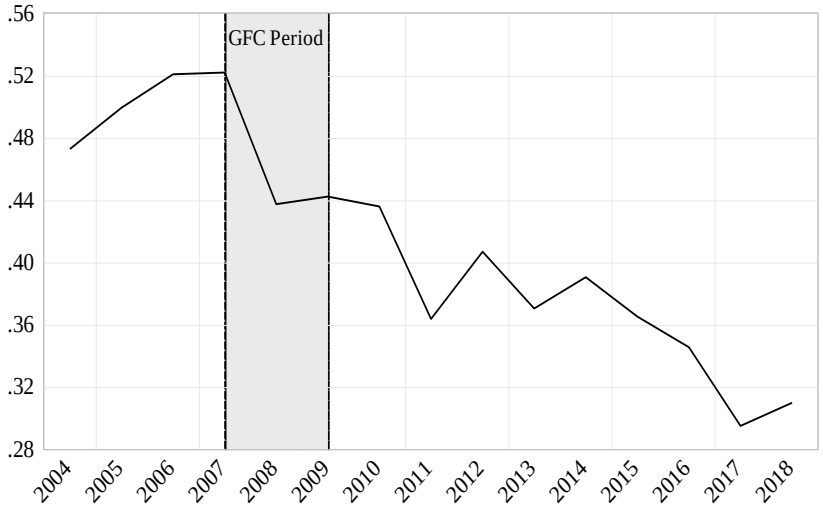


Figure 2: Trends in the different dimensions of the BSI

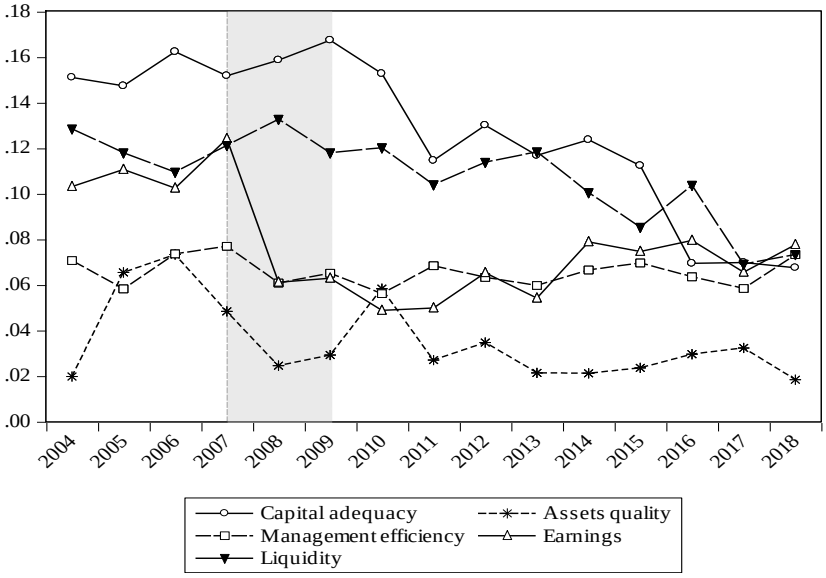


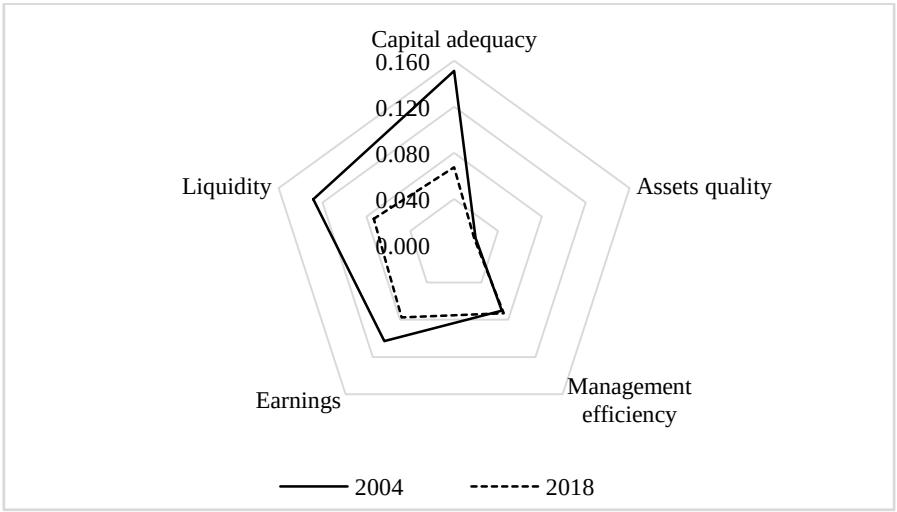
Fig. 2 presents the moments in the different dimensions of bank stability during the study period. The capital adequacy dimension showed a decaying trend post-2009 and continued for the rest of the study period. Prior to 2009, the capital adequacy dimension remained more or less stable. The Earnings exhibited a significant fall, starting in 2007. It was the largest fall in earnings during the whole study period. This decline continued till 2011; however, the pace of decline slowed from 2008 onwards. Post-2011, earnings started to exhibit a rising trend; however, it is still

lower than the pre-crisis period. Similarly, the asset quality was improving during the initial years of the study period till 2006; however, from 2006 onwards, the trend reversed and started to fall.

The asset quality started to improve from 2008 onwards and achieved the second-highest level in 2010 during the study period. From 2010 onwards, it showed a mild deteriorating trend till 2013; however, the year 2012 observed some improvement in the asset quality. The graph exhibited a continuous improvement in the asset quality from 2013 to 2017 before falling in 2017. The liquidity dimension has exhibited a mild deteriorating trend during the whole study period; however, it fell significantly post-2013 onwards. Management efficiency is the only dimension that has not exhibited any particular trend. From this figure, it is evident that capital adequacy, earnings and asset quality, have played a significant role in the continuous deterioration of bank stability.

Fig. 3 compares the dimensional indices of bank stability in 2004 and 2018 using the radar chart. In comparison to 2004, capital adequacy, liquidity and earnings have exhibited considerable deterioration. The assets quality and Management efficiency dimension remained at the initial levels of 2004 in 2018. The most considerable deterioration is visible in the capital adequacy dimension, followed by liquidity and earnings.

Figure 3: Dimensions of BSI in 2004 and 2018



5.2 Categorisation of banks

Following Ghosh (2011), the study categorised the banks into three categories: stable, moderately-stable, and less-stable. Table 6 presents the categorisation of the banks into different categories based on respective BSI values. Banks with BSI value falling in the top ten percentile and bottom ten percentile of the BSI are classified as stable and less stable banks, respectively. Taking 2004 as a reference year, bottom and top index values are 0.342 and 0.642, respectively. Following this, the banks with a BSI value of 0.642 and above are categorised under a stable banks' category, and banks with a BSI value of 0.342 and below are categorised under less stable banks. The banks with BSI values falling between the upper and lower bound of BSI, i.e., 0.642 and 0.342, have been categorised as moderately stable banks.

Table 6: Categorisation of banks as per their respective BSI value

Year	Stable	Moderately stable	Less stable	Total
2004	1	11	1	13
2005	1	13	1	15
2006	0	15	0	15
2007	3	12	0	15
2008	0	15	1	16
2009	1	13	2	16
2010	0	18	5	23
2011	0	13	11	24
2012	0	23	5	28
2013	0	17	11	28
2014	0	21	7	28
2015	0	16	12	28
2016	0	13	14	27
2017	0	5	22	27
2018	0	6	21	27

Source: *Authors' computations.*

The banks' categorisation into different categories reveals that the number of banks in the less stable category has increased drastically during the study period. The majority of the banks were in the moderately stable category until 2015; however, post that most banks are falling under the less stable category. Post-2009, no bank has qualified for the stable category.

5.3 Determinants of bank stability

System GMM results

Prior to employing any panel data assessment technique, we assessed the stationarity of the variables by employing the Fisher-Augmented Dickey-Fuller (Fisher-ADF) and Fisher-Phillips-Perron (Fisher-PP) test and found that all the variables employed are stationary. The results of the unit-root tests are given in table 7.

Table 7: Panel unit root tests

Variables	Fisher-ADF	Fisher-PP
BSI	100.061***	149.533***
SIZE	128.084***	73.491***
ROA	145.763***	106.569***
CREDIT	241.571***	183.869***
INEFF	218.608	110.377***
GNPL RATIO	76.458**	98.217**
NII	241.605***	260.471***
CR3	90.234***	31.929**
BOONE	114.399***	47.422**
RGDP	273.645***	139.475***
INF	78.541**	144.332***
REER	153.037***	131.664***
CC	72.240***	36.816***
GE	128.148***	392.902***
PS	95.227***	116.108***
RQ	102.056***	138.422**
RL	107.204***	30.318**
VA	223.638***	256.247***

Note : (i) SIZE, Log of total assets; ROA, Log of return on assets; CREDIT, Log of growth in loan and advances; INEFF, Log of operating expenses to total assets ratio; GNPL, Log of gross non-performing loan ratio; NII, Log of non-interest income to total assets ratio; CR_3, log of concentration ratio; BOONE, log of Boone indicator; RGDP, log of real GDP growth rate; IR, log of inflation rate; REER, log of real effective exchange rate; CC, Log of control of corruption indicator; RL, Log of rule of law indicator.

Source: *Authors' computations.*

Table 8: Correlation matrix

Variables	SIZE	ROA	CREDIT	INEFF	GNPL	NII	CR3	BOONE	RGDP	INF	REER	CC	GE	PS	RQ	RL	VA
SIZE	1																
ROA	0.257	1															
CREDIT	-0.167	-0.124	1														
INEFF	-0.173	0.082	-0.071	1													
GNPL	-0.021	-0.22	-0.212	0.102	1												
NII	-0.344	-0.039	0.136	-0.082	0.175	1											
CR3	-0.614	-0.147	0.019	-0.171	0.355	0.487	1										
BOONE	-0.136	-0.105	0.140	-0.189	0.104	-0.136	0.125	1									
RGDP	-0.097	0.034	0.321	0.183	0.041	0.292	0.116	-0.054	1								
INF	0.255	0.184	0.013	0.254	-0.196	-0.212	-0.444	-0.238	0.100	1							
REER	0.581	0.079	-0.056	-0.039	-0.276	-0.563	-0.550	0.169	-0.238	0.371	1						
CC	0.111	0.007	0.193	-0.042	-0.054	-0.092	-0.171	0.143	0.256	0.082	0.342	1					
GE	-0.155	-0.019	-0.1366	-0.234	0.101	0.189	0.345	0.191	-0.164	-0.523	-0.344	-0.446	1				
PS	0.592	0.101	-0.034	0.041	-0.298	-0.550	-0.577	0.136	-0.072	0.347	0.522	0.355	-0.185	1			
RQ	-0.415	-0.102	-0.075	-0.328	0.297	0.334	0.501	0.179	0.017	-0.489	-0.612	-0.380	0.468	-0.607	1		
RL	0.036	-0.151	0.185	-0.287	0.088	0.256	-0.019	0.424	0.251	-0.445	0.209	0.256	0.120	0.214	0.108	1	
VA	0.571	0.206	-0.062	0.079	-0.337	-0.372	-0.578	-0.166	-0.154	0.33	0.643	0.052	-0.010	0.754	-0.569	-0.071	1

Source: *Authors' computations.*

The presence of multicollinearity can impact the results; hence, we employed the Pearson's correlation to test multicollinearity. We set the threshold of multicollinearity at 0.7 following Kennedy (2008). Table 8 presents the correlation results and shows that there is no evidence of multicollinearity in our dataset. The correlation coefficient falls below the set threshold.

Tables 9 and 10 report the results of the dynamic panel model employed in the empirical assessment of the determinants of bank stability. Column (i) is the baseline model, and columns (ii) to (xi) are the extensions of the base model. Preliminary tests suggest that model fits well to panel data, and the results of the model are consistent and reliable. The Wald test is significant in all the different model specifications, confirming the parameters' joint significance. Hansen j test confirms the instruments' validity in all model specifications and suggests that the instruments used are not correlated with the residuals. We performed Arellano-Bond AR(1) and AR(2) tests to detect the first and second-order correlations among the residuals, and it suggests a first-order correlation and no second-order correlation, as desired.

Persistence effect

The coefficient of the lagged dependent variable captures the persistence effect of bank stability. The coefficient of this variable can vary between 0 and 1. The results of the system GMM presented in table 9 and 10 suggest that there do exist a positive and statistically significant bank stability persistence. Results reveal that around 50-60 percent effect of bank stability persists in the subsequent year. Alternatively, the stability attained by a bank in a particular year can positively influence the stability of subsequent year. The existence of a positive and statistically significant persistence effect is consistent in all different model specifications. Hence it can be stated that the time persistence of the bank stability exists in the Nepalese baking industry.

Bank-specific effects

Table 9 and 10 provides the following insights about the relationship between bank-specific variables and bank stability. First, as per our prior expectation, the variable bank size positively impacts bank stability in most model specifications; however,

the relationship is weak statistically; hence, the finding does not support the too big to fail presumption. Similarly, ROA reports a positive relationship with bank stability; however, the effect is not significant. A positive relationship appears to suggest that banks with higher ROA are better utilising the returns in strengthening the stability of the banks by making provisions and building up their capital strength.

Second, contrary to our prior expectation, credit growth has a negative and statistically significant impact on bank stability in most model specifications. This indicates that the commercial banks are generating more NPAs by expanding the credit, which is adversely impacting their stability. One possible explanation for this finding might be the problem of adverse selection and a flawed credit screening process.

Third, the variable (in) efficiency suggests a positive and statistically significant impact on the stability of the banks in most of the model specifications. This suggests that banks with higher operating expenses are more stable than the banks with lower operating expenses. One possible explanation for this relationship is that banks with higher operating expenses are incurring expenses for improving the credit screening, hiring and incentivising the efficient staff, which resulting in an efficient allocation of funds and higher stability. The gross non-performing loans exhibit a negative impact on the stability of the banks as per our prior expectations; however, the effect is not very strong statistically.

Fourth, as per our prior expectation, diversification has a very strong positive relationship with the stability of the banks. This suggests that banks with a higher level of income diversification are more stable than less diversified banks. Hence findings of this study support the diversification-stability hypothesis.

Table 9: Two-step system GMM results

Dependent variable: BSI

Model specifications→ Variables↓	(i)	(ii)	(iii)	(iv)	(v)
Constant	-2.133	-5.563*	-12.530***	-10.71***	-13.930***
	(2.021)	(2.877)	(2.660)	(2.902)	(3.458)
BSI_{t-1}	0.535***	0.473***	0.447**	0.483***	0.620***
	(0.149)	(0.161)	(0.219)	(0.136)	(0.184)
SIZE	0.125*	0.014	0.033	0.090	0.052
	(0.060)	(0.111)	(0.066)	(0.078)	(0.102)
ROA	0.060	0.060	0.097	0.044	0.102
	(0.091)	(0.091)	(0.107)	(0.063)	(0.150)
CREDIT	-0.039**	-0.028*	-0.028*	-0.028**	-0.021
	(0.017)	(0.016)	(0.016)	(0.012)	(0.015)
INEFF	1.219	2.787*	4.851***	4.914***	3.663**
	(1.462)	(1.467)	(1.861)	(1.205)	(1.961)
GNPL	-0.033	-0.101	-0.092	-0.076	-0.075
	(0.055)	(0.073)	(0.095)	(0.086)	(0.084)
NII	0.805**	1.120***	1.447***	1.189***	1.325***
	(0.406)	(0.407)	(0.341)	(0.265)	(0.508)
CR3		0.274	0.683***	0.791***	0.977***
		(0.225)	(0.248)	(0.300)	(0.308)
BOONE		1.841	-2.264	-0.898	-1.660
		(2.053)	(3.275)	(2.305)	(3.235)
RGDP			-0.038*	-0.048***	-0.046**
			(0.022)	(0.018)	(0.020)
IR			-0.145*	-0.119***	0.248
			(0.076)	(0.041)	(0.370)
REER			0.738**	0.341	0.714
			(0.336)	(0.348)	(0.437)
IINDEX				0.068**	0.082*
				(0.031)	(0.045)
GFC					-0.077
					(0.180)
Time dummies					Yes
N	328	328	328	328	328
Groups	28	28	28	28	28
Instruments	26	26	26	26	26
Wald chi2	259.97***	493.45***	627.91***	666.21***	795.85
AR(1)	-2.94	-2.87	-2.50	-3.09	-2.35
	(0.003)	(0.004)	(0.012)	(0.002)	(0.019)
AR(2)	1.15	0.97	0.77	1.33	1.46
	(0.251)	(0.332)	(0.438)	(0.183)	(0.145)
Hansen j	19.00	20.23	15.25	9.88	13.45
	(0.391)	(0.210)	(0.228)	(0.541)	(0.200)

Notes: (i) SIZE, Log of total assets; ROA, Log of return on assets; CREDIT, Log of growth in loan and advances; INEFF, Log of operating expenses to total assets ratio; GNPL, Log of gross non-performing loan ratio; NII, Log of non-interest income to total assets ratio; CR3, log of concentration ratio; BOONE, log of Boone indicator; RGDP, log of real GDP growth rate; IR, log of inflation rate; REER, log of real effective exchange rate; IINDEX, log of institutional index (ii) AR(1) and AR(2) represent the test statistics of Arellano-Bond tests of the autocorrelation of order 1 and order 2 respectively (iii)Robust standard errors are given in parentheses (iv) p-value is reported in case of AR(1), AR(2) and Hansen tests (v) ***,**, and * represents the significance levels at 1%, 5%, and 10%, respectively.

Source: *Authors' computations.*

Industry-specific effects

In the case of industry-specific variables, the concentration measure CR3 results report a positive impact on the stability of the banks. This finding is contrary to Boyd et al. (2006) and Berger et al. (2009). This suggests that higher concentration strengthens the stability of commercial banks. This finding is as per our prior expectation and lends supports to the concentration stability hypothesis. One explanation for this relationship is that increase in the concentration and market power improves the stability of the banks by discouraging excessive risk-taking.

The results show that the Boone indicator negatively impacts stability. This suggests that deterioration in the competitive conduct of a bank negatively impact the stability of the banks. This finding is not significant statistically; hence results do not support the quiet life hypothesis[4].

Macroeconomic effects

In the macroeconomic variable, real GDP appears to have a negative impact on the stability of the banks. This appears to suggest that banks build up higher NPAs during the rise in economic activities. This finding reconfirms our result, suggesting a negative relationship between credit growth and bank stability.

The inflation rate is exhibiting a negative and statistically significant impact on bank stability in most of the model specifications. This suggests that the general price levels in the Nepalese economy do have a significant bearing on the stability of the banks, and a higher level of inflation do significant harm to the stability of the banks.

The variable REER has a positive relationship with stability, suggesting that appreciation in the value of the native currency relative to the dollar strengthen the stability of the banks. One possible explanation for this finding is that appreciation in the Nepalese rupee reduces the international debt burden. Further, the results reveal that GFC had no significant impact on the stability of the Nepalese banking industry. This might be due to less exposure of the banks internationally.

[4] The quiet life hypothesis suggests that banks with more market power are less efficient as the management of such banks pay less attention toward improving the efficiency.

Table 10: Two-step system GMM results

Dependent variable: BSI

Model specifiations→ Variables↓	(vi)	(vii)	(viii)	(ix)	(x)	(xi)
Constant	-11.771***	-11.920***	-12.830***	-11.720***	-17.650***	-8.821
	(2.659)	(3.090)	(3.854)	(3.467)	(4.296)	(6.095)
BSI_{t-1}	0.442**	0.428**	0.434*	0.567***	0.534***	0.476**
	(0.180)	(0.208)	(0.237)	(0.137)	(0.166)	(0.187)
SIZE	0.109	0.038	0.033	0.049	0.059	0.014
	(0.087)	(0.077)	(0.099)	(0.072)	(0.060)	(0.074)
ROA	0.033	0.059	0.063	0.107	0.055	0.064
	(0.094)	(0.121)	(0.134)	(0.099)	(0.097)	(0.130)
CREDIT	-0.023	-0.032**	-0.034**	-0.034***	-0.019	-0.044**
	(0.015)	(0.013)	(0.017)	(0.011)	(0.022)	(0.021)
INEFF	5.738***	4.672**	4.605*	4.272***	4.646***	3.878**
	(1.766)	(1.911)	(2.428)	(1.248)	(1.311)	(1.636)
GNPL	-0.102	-0.085	-0.102	-0.046	-0.081	-0.071
	(0.110)	(0.095)	(0.107)	(0.082)	(0.065)	(0.087)
NII	1.294***	1.461***	1.521***	0.954***	1.778***	1.282**
	(0.266)	(0.395)	(0.519)	(0.349)	(0.379)	(0.611)
CR3	0.746***	0.634**	0.620**	0.841**	0.850***	0.253
	(0.248)	(0.251)	(0.275)	(0.330)	(0.269)	(0.591)
BOONE	-1.266	-1.690	-1.355	-1.819	-0.319	-1.716
	(3.012)	(3.317)	(4.393)	(2.483)	(3.165)	(2.751)
RGDP	-0.055**	-0.037**	-0.027	-0.025	0.021	-0.030*
	(0.023)	(0.017)	(0.034)	(0.021)	(0.044)	(0.017)
IR	-0.110**	-0.147**	-0.148	-0.113*	-0.259***	-0.128
	(0.051)	(0.072)	(0.094)	(0.061)	(0.086)	(0.084)
REER	0.517	0.607	0.798*	0.720**	1.332***	0.451
	(0.374)	(0.417)	(0.417)	(0.338)	(0.500)	(0.556)
GFC	-0.042	-0.002	-0.005	0.048	0.012	-0.060
	(0.093)	(0.107)	(0.109)	(0.099)	(0.065)	(0.152)
CC	0.350					
	(0.294)					
GE		-0.170				
		(0.304)				
PS			0.114			
			(0.358)			
RQ				-0.612**		
				(0.299)		
RL					-0.980*	
					(0.571)	
VA						0.453
						(0.556)
N	328	328	328	328	328	328
Groups	28	28	28	28	28	28
Instruments	26	26	26	26	26	26
Wald chi2	749.66***	539.50***	537.36***	490.24***	770.31***	598.43***
AR(1)	-2.69	-2.64	-2.58	-3.18	-3.19	-2.59
	(0.007)	(0.008)	(0.010)	(0.001)	(0.001)	(0.010)
AR(2)	1.10	1.03	0.99	0.61	1.40	0.64
	(0.269)	(0.303)	(0.322)	(0.545)	(0.161)	(0.523)
Hansen j	11.82	13.74	14.34	11.34	11.33	13.00
	(0.377	(0.248)	(0.215)	(0.415)	(0.416)	(0.294)

Notes: (i) CC, Log of control of corruption indicator; GE, Log of government effectiveness indicator; PS, Log of political stability indicator; RQ, Log of regulatory quality indicator; RL, Log of rule of law indicator ; VA, Log of voice and accountability indicator (ii) AR(1) and AR(2) represent the test statistics of Arellano-Bond tests of the autocorrelation of order 1 and order 2 respectively (iii)Robust standard errors are given in parentheses (iv) p-value is reported in case of AR(1), AR(2) and Hansen tests (v) ***,**, and * represents the significance levels at 1%, 5%, and 10%, respectively.

Source: *Authors' computations.*

Institutional effects

The institutional quality index suggests a positive relationship with bank stability. This suggests that all institutional indicators combinedly have a positive impact on the stability of the banks; hence, this finding provides a basis for accepting the "grease the wheels[5]" hypothesis. However, in the case of individual indicators, only two institutional indicators, namely, regulatory quality and the rule of law, significantly impact the banks' stability. Both these indicators have a negative impact on the stability of the banks. Hence, we accept the "sand the wheel" hypothesis in the case of these two indicators.

Robustness check

The robustness of the results is tested using the alternative model specifications, namely pooled Ordinary Least Square (OLS), fixed effects, and Panel Corrected Standard Errors. Table 11 reports the results of the alternative models.

The results of the alternative models broadly confirm our findings. All three models confirm the existence of significant bank stability persistence; however, the estimated coefficient of the lagged dependent variable is overestimated in the case of pooled OLS and underestimated in the case of panel fixed effects. This result of alternative models validates the use of the system GMM.

5 The "grease the wheels" hypothesis implies that the institutional indicators improve the efficiency of the system which results in positive outcome, contrary to this "sand the wheels" hypothesis suggests a negative impact of institutional indicator.

Table 11: Results of pooled OLS, fixed effect and Panel corrected standard error (PCSE) models.

Models→ Variables↓	Pooled OLS	Fixed effect	Panel corrected standard error (PCSE)
	(i)	(ii)	(iii)
Constant	-23.92**	-21.32*	-23.92***
	(11.80)	(11.39)	(2.819)
BSI_{t-1}	0.597***	0.358***	0.597***
	(0.067)	(0.092)	(0.041)
SIZE	0.044**	0.046	0.044**
	(0.022)	(0.059)	(0.015)
ROA	0.043**	-0.050*	0.043**
	(0.021)	(0.018)	(0.010
CREDIT	-0.011*	-0.007	-0.011**
	(0.005)	(0.004)	(0.005
INEFF	2.154***	1.919	2.154***
	(0.628)	(1.224)	(0.390)
GNPL	-0.043***	-0.063**	-0.043***
	(0.015)	(0.029)	(0.010)
NII	1.783***	1.596***	1.783***
	(0.388)	(0.389)	(0.147)
CR3	1.676	1.568	1.676**
	(1.213)	(1.209)	(0.229)
BOONE	0.861	0.957	0.861*
	(1.424)	(1.633)	(0.514)
RGDP	0.059	0.047	0.059
	(0.071)	(0.067)	(0.020)
IR	-0.319***	-0.298**	-0.319***
	(0.123)	(0.124)	(0.031)
REER	1.788*	1.699*	1.788**
	(1.019)	(0.905)	(0.285)
GFC	-0.305	-0.288	-0.305
	(0.220)	(0.206)	(0.051)
CC	-0.841	-0.720	-0.841
	(1.020)	(1.112)	(0.206)
GE	-0.892	-0.819	-0.892
	(1.007)	(1.158)	(0.196)
PS	0.542	-0.565	0.542
	(0.464)	(0.406)	(0.129)
RQ	-1.274	-1.164	-1.274**
	(1.171)	(1.284)	(0.229)
RL	-0.255	-0.076	-0.255**
	(0.430)	(0.413)	(0.094)
VA	1.375	1.388	1.375
	(1.467)	(1.484)	(0.302)
F-statistics	37.55***	174.98***	
R^2	0.698	0.656	0.698

Notes: (i) Robust standard errors are given in parentheses (iii) ***, **, and * represents the significance levels at 1%, 5%, and 10%, respectively.

Source: *Authors' computations.*

VI. CONCLUSIONS AND POLICY IMPLICATIONS

The present study investigates the stability of commercial banks operating in the Nepalese banking industry and assesses the period from 2004 to 2018. The study constructs a multi-dimensional bank stability index using the PCA weighted, CAMEL approach to assess bank stability. The study relies on the two-step system

GMM to estimate the bank stability persistence and determinants of bank stability. The empirical results of this study are robust and are broadly consistent with the alternative panel estimation techniques.

The empirical results of the study reveal the following. First, the Nepal banking industry has seen continuous deterioration in the stability post-2007. The stability of the Nepal banking industry was at the highest point in the year 2007, post that it showed a continuous decay. Second, the exploration of different dimensions of BSI reveals that capital adequacy, earnings and assets quality are the key dimensions that have caused deterioration in the overall bank stability during the study period. The earning of the commercial bank fell considerably during 2008-2009. Policymakers need to look into these dimensions and take remedial measures to improve them. The categorisation of banks into stable, moderate, and less stable categories suggests that most of the banks in Nepal were in the moderately stable category during 2004-2014; however, post-2015, most banks shifted to the less-stable category. The number of less-stable banks has increased continuously during the study period.

The analysis of bank stability determinants confirms the presence of a positive persistence effect of bank stability. Estimation results show that around 50-60 percent impact of the bank stability persists in the following year. This implies that the impact of bank stability attained in a particular year has a positive impact on the stability of the subsequent year. This finding provides evidence of the time persistent effect of bank stability in the Nepalese banking industry. The important implication of this finding is that banks can significantly reduce the adverse impact of potential instability threat in the subsequent year by strengthening the stability of the current period. In the case of bank-specific variables, the results reveal that bank size has a weak positive impact on stability. This gives the impression that bigger banks are engaging in less risk-taking and doing better credit screening than small banks.

Results of the study report a negative relationship between loan growth and stability. This finding raises worries about the credit screening and allocation process of commercial banks. The authorities need to be more vigilant about credit growth as it may induce adverse selection. Commercial banks of Nepal need to improve credit screening by improving risk assessment.

The findings of this study support the diversification-stability nexus suggesting that income diversification is an important factor positively contributing to the stability of the banks. This finding suggests that the banks can intensify the reliance on non-traditional sources of revenue for strengthening their stability. The regulatory authorities can promote income diversification in the Nepalese banking industry to diversify risk and strengthen the banks' stability.

This result of the study supports the concentration stability hypothesis, which suggests that higher concentration discourages excessive risk-taking and hence strengthen the stability of the banks. The results reveal that inflation is a significant factor impacting the stability of the banks. It has a strong negative and statistically significant impact on bank stability. The rate of inflation in Nepal was very high during the 2007 to 2016 period, and our results suggest that the stability of the banks deteriorated considerably during this period. This finding advocates that the regulatory authorities need to maintain a steady and low level of inflation in order to strengthen the stability of the banks. Finally, the results of the study reveal that the GFC had no significant impact on the stability of the Nepalese banking industry.

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APPENDIX

A. PCA weights computation

For computations of the weights to distinct dimensions of bank stability, we relied on the principal component analysis (PCA) approach. This approach determines data-generated endogenous weights and factors in the relative importance of each dimension to the overall bank stability index. Table A1 presents the PCA weights computation process.

Table A1

Weights calculation for different dimensions of BSI using Principal Component Analysis

	Rotated Component Matrix			Eigenvalues			Absolute Weights	% Weights
Dimensions	1	2	3	***1.526***	***1.165***	***1.113***	-	-
Capital Adequacy	.747	.100	.202	1.141	0.116	0.225	1.481	20
Asset quality	.825	-.062	-.097	1.258	-0.073	-0.108	1.439	20
Management efficiency	-.103	.896	.221	-0.157	1.044	0.245	1.133	16
Earnings	.127	.112	.904	0.193	0.130	1.006	1.329	18
Liquidity	-.374	-.642	.493	-0.571	-0.748	0.548	1.867	26
							7.249	100

Notes: Extraction Method: Principal Component Analysis, Rotation Method:Varimax with Kaisernormalisation.

Source: *Authors' Computations*

In the first step, we obtain the rotated component matrix and eigenvalues by applying PCA on different dimensions of BSI. The eigenvalues in our case are 1.526, 1.165, and 1.113, respectively. In the second step, we multiply the eigenvalues with rotated components to obtain eigenvalues corresponding to each dimension of BSI. In the third step, we obtain the absolute weights by summing the eigenvalues obtained in the second step. While computing the absolute weights, the eigenvalues with a negative sign are ignored; hence the negative eigenvalue is considered positive. Finally, the percentage weights are obtained by computing the relative strength of absolute weight to total absolute weight.